

## NORTH CAROLINA STATE UNIVERSITY AT RALEIGH

SCHOOL OF PHYSICAL AND MATHEMATICAL SCIENCES

DEPARTMENT OF GEOSCIENCES  
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## Quarterly Progress Report

December 1974 - February 1975

Investigation Title: Utilization of EREP Data in Geological Evaluation  
Regional Planning, Forest Management, and Water  
Management in North Carolina

EREP Investigation No.: 018

Contract No.: NAS9-13321

Principal Investigator: Charles W. Welby

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NASA Technical Monitor: Mr. James C. Derington  
Code EF 33  
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During the December - February Quarter work was continued on the mapping of vegetation and crops in northeastern North Carolina. The final draft of the vegetation map of Perquimans and Pasquotank counties is being prepared, and additional ground checking is being carried out. A final report on this project, including statements concerning accuracy of identification benefit/cost ratio, and possible advantages of SKYLAB-type imagery for inventorying of crops in northeastern North Carolina, is in final stages of preparation. Further checking is required to develop explanations for discrepancies between acreage values of various crops as reported by the North Carolina Department of Agriculture and the values determined from SKYLAB imagery. Attempts to identify vegetational types in the area by using density slicing techniques are still being evaluated.

(E75-10159) UTILIZATION OF EREP DATA IN  
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FOREST MANAGEMENT, AND WATER MANAGEMENT IN  
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An outgrowth of the study of the coastal imagery has been the start of a preliminary investigation into the possibility that SKYLAB-type imagery could be used to monitor eutrophication and sedimentation in some of the small and medium-sized lakes of northeastern North Carolina. If space-acquired imagery could be demonstrated to be useful for this purpose, it should provide a relatively inexpensive way for state agencies to keep up with potential danger spots and to utilize their manpower more efficiently and economically.

Studies of Oregon, Hatteras, and Ocracoke inlets were worked on intermittently during the quarter. Attempts are being made to locate some ground truth in the form of recent fathograms made for other studies. Also attempts will be made to synthesize the results of these studies to see if the SKYLAB pictures give any clues pertaining to current flow through these features. Density slicing has been carried out on transparencies showing the inlets in an attempt to relate water depth to reflectances. This study should be completed during the coming quarter.

Because there had been no actual work done on the SKYLAB imagery in this project showing the accuracy with which an interpreter could measure distances on the imagery, a study was made during January to answer this question. The question is an important one to answer locally, for if the imagery is to be used by North Carolina planning personnel, there must be a local experience to which they can relate. A Bausch and Lomb Zoom 70 stereoscope with projected scale micrometer was used to make the measurements on the imagery; actual dimensions were determined in the field or from accurately surveyed maps. Appended to this report is a summary of the results of the study and a plot showing percent error vs actual length.

Toward the end of the quarter a study was initiated to evaluate the SKYLAB imagery as a monitoring tool for gravel and sand quarries. Two quarries in the North Carolina coastal plain near Lillington are being studied. The purpose of this investigation is to learn the limits to which the imagery can be put in monitoring quarry operations and possible degradation of vegetation surrounding the quarry. Attention is also to be given to use of imagery at the SKYLAB scale for monitoring land reclamation procedures.

Also toward the end of the quarter a study of the possible contribution of SKYLAB imagery can make in the assessment of the environmental impact that a proposed new runway at Raleigh-Durham airport will have on the surrounding area was begun. This problem is of interest to the airport management, local and regional governmental officials, as well as people living in the Research Triangle area. The study should end with an evaluation of the benefit/cost ratio of the use of the SKYLAB imagery for putting together necessary land use information and for seeing the relationships between seemingly unrelated factors.

Work has continued on the project evaluating SKYLAB imagery for land use interpretations in a typical Piedmont region county, Wake County. Several land use maps have been constructed from various combinations of the imagery. The maps so constructed have been and are being checked against ground truth in the form of high altitude photography and data gathered during field checks.

Preliminary evaluation of the accuracy of the mapping techniques is given below:

S190B	Color transparencies	90%
70mm	Color transparencies	87%
70mm	Color infrared transparencies	82%

A significant portion of the errors that were made in interpretation are related to small areas that could be recognized in field checking or on the high altitude air photographs but could not be differentiated in the SKYLAB imagery.

Based upon the 115 square miles of Wake County mapped during this study, the whole of Wake County (859 sq. mi.) could be mapped with the accuracy noted above in about 135 man-hours. However, it is believed that a person with more detailed knowledge of the county than the investigator, could map the county in fewer hours at the same level accuracy.

For the next quarter it is proposed to complete the study of the inlets, do some additional ground truth evaluation of the imagery in the Asheville area, to initiate and complete appropriate studies on the usefulness of both the S190A and S190B data for outlining favorable areas for state parks in the Piedmont region and for studying the effects of urbanizing processes on the region from Charlotte to Raleigh. Attention will also be given to use of the imagery for geologic evaluation of parts of the Piedmont region. The S192 imagery is yet to be studied and evaluated, both for the passes made over the coastal region and for the passes along the Piedmont. The chief way in which this data must be studied is with an optical enhancement technique, chiefly density slicing, although attempts will be made to combine various bands through use of a color additive viewer.

Funding for completion of the study by June 30, 1975, is adequate. However, due to the fact that in January the principal investigator was unexpectedly assigned an additional teaching load, his work on the project has of necessity been less than planned during January and February.

It is conceivable that a request for a no-cost contract extension to September 1, 1975, may be necessary. However, before this request is made, progress during March and April will be evaluated.

SCALE, AREA MEASUREMENTS, AND LOWER  
LIMITS OF RESOLUTION FOR SKYLAB S-190B  
AERIAL COLOR PHOTOGRAPHS

J. Godfrey

Roll 86, Frame 293; Roll 88, Frame 150

Flight date: September, 1973

Ground check: January, 1975

Localities: Upchurch Community, Wake Co. - Sand ridge; riding ring

N. C. S. U. campus; Carter Stadium

N. C. S. U. Farm Unit #2 - various fields

Runway, Raleigh-Durham Airport

The purpose of this investigation was examination of the accuracy and resolution possible with SKYLAB S-190B color photographs under nearly ideal conditions, specifically:

- a) surface features were not obscured by haze or clouds,
- b) selected features afforded excellent contrast with surrounding terrain,
- c) the localities were familiar to the investigator and were accessible by good roads.

The SKYLAB S-190B color photos gave excellent accuracy and resolving power on all manmade objects having sharp contrast with adjacent features. Measurements of dimensions greater than 200 feet resulted in 5 percent error or less. Objects 75 feet on a side could easily be resolved, though accurate measurement of such features could not be made with the Bausch & Lomb Zoom 70 Stereoscope. Perhaps a finer scale on the micrometer would improve the interpretation. In one field, for instance, a tree line 30 feet wide could just be detected as a dark line on the imagery. It was approximately twice the width of the scale pointer. This would explain why (even with our lowest percent error) dimensions of well-defined objects could never consistently be measured to a greater accuracy than +20 feet.

Accuracy on agricultural features was not as good in the 75 ft.-500 ft. range, but at 1000 feet, percent error had dropped to nearly that of the manmade features. In all probability, superposition of other photographic bands and color enhancement would allow the viewer to distinguish between types of vegetation and crop cover, thus greatly improving accuracy. A comparison of S-190B and S-190A 70mm imagery revealed that the features measured in this study could not be identified with the S-190A, except on black and white photos in the .6 to .7 $\mu$  band. Even then, resolution was not as good nor were boundaries as sharp as on the S-190B.

The accompanying graph shows the relationship between the percent error using S-190B pictures and the dimension of the object measured.

Man-made Features — . . .

Seasonal Features — x x x

Graph Check — ⊙ ⊗

Error (± Feet)

